Minutes – ASTM E12.11.05 Flashing Lights

Second Meeting, Ft. Lauderdale, FL

2:45 – 4:15 pm, January 21, 2002

Y. Ohno

Attendance

Yoshi Ohno (Chair)
J. Rennilson
Carl Andersen
Dennis Couzin
Richard Austin
Alan Kravetz
Cameron Miller (observer)

Review of the last meeting minutes

The last meeting minutes were reviewed for each action item as below.

1): With the help of Dennis, Chairman made a substantial analysis on the existing methods. The results to be presented this time.
2): To be discussed this time.
3): Chairman discussed with CIE Div.1 Director, Ken Sagawa in Rochester. Dennis made a proposal for a reportership at D1 meeting in Rochester, and D1 agreed to establish a reportership on this subject, with Dennis being the reporter. The purpose of this reportership is to keep CIE D1 informed of our activities in our ASTM WG and get advices as necessary.
4): Chairman sent to Alan copies of all papers of his possession in December. Alan is to write a draft by next meeting.
5): This action has not been complete. Chairman to contact the people suggested by J.

Presentation by Chairman

Chairman presented the results of his recent computational study on the Blondel-Rey (-Douglas), Form Factor, and Allard methods, and proposed the Modified Allard method as already circulated by email. The main points of the presentation are summarized below.

1. Dennis Couzin's proposal

1) Dennis presented at CIE TC2-49 meeting in London in April 2000 that Form Factor method fails for a pulse with a sharp noise, and proposed that effective intensity be measured as the peak of a convolution of the flash pulse with a certain visual impulse function. He used a Gaussian function as an example.

2) Dennis proposed at the last E12.11.05 meeting in Rochester that Allard method (1876) is based on a convolution with an exponential visual impulse function, and is close to what he had proposed in London. Couzin suggested that the Allard method could be updated by adjusting this function to one that matched the later data for simple pulses. He showed a "beautified" version of Allard's $q(t)$ that resembled physiological functions and gave effective intensity values for rectangular pulses lower than Blondel-Rey.

2. Results of the analysis on the three existing methods

A computation analysis was made using 10 different waveforms of pulses with duration from 0.001 s to 100 s. The waveforms included asymmetric triangles, modulated pulse, and trains of pulses.

1) For rectangular and trapezoidal pulses, Allard method (original) deviates significantly (up to 30 %) from Blondel-Rey-Douglas and Form Factor.
2) Form Factor method fails for "Dennis" pulse (a sharp noise added on the slow pulse).
3) Blondel-Rey-Douglas fails for modulated pulse at a certain duration and longer.
4) Both Form Factor and Blondel-Rey-Douglas fail for a train of short pulses.
5) No problem was found on Allard for any pulses, except for the problem 1.

3. Introduction of Modified Allard method

To solve the problem 1) above, Chairman modified the Allard's visual impulse function using two exponential functions having different time constants while keeping the benefit of realizing it by simple analog circuitry. Optimization of the two time constants made it possible to match the results to those of Blondel-Rey for rectangular pulses to within 5 %. Using this modified function, it seems all the problems with the existing methods mentioned above have been solved, as confirmed below.

1) Modified Allard method (as optimized in the example presented) gives practically equivalent results (within 5 % difference) to Blondel-Rey (-Douglas) for single rectangular pulses.
2) It solves the problem of "Dennis" pulse.
3) It gives reasonable results for a train of pulses at any duration while Form Factor and Blondel-Rey-Douglas fail. For a train of short pulses for different duration (different interval), Modified Allard shows a beautiful transition from a line representing results from four pulsles to a line representing results from a single pulse.
4) If necessary, it can be further optimized to fit experimental data that deviates from Blondel-Rey in the 0.1 to 1 s region.
5) It can be realized by simple analog circuits, which is an important requirement to produce portable photometers.

Chairman now believes that the Modified Allard method is the best solution to practical measurements of effective intensity for any waveforms of pulses.

The Chairman's presentation is posted at: http://cie2.nist.gov/ASTM_E12_WG05/home.html

Discussion

The members present had no objections to Chairman's results, and agreed that it seems the Modified Allard method produces the best results for any waveforms of pulses. Chairman suggested a need for visual experiments to confirm it, e.g., the visual response to asymmetric triangles and train of short pulses at varied intervals, for which no experimental data has been available. The time ran out for the meeting, and Chairman suggested continuing discussion on e-mail reflector on the possibility and plan for visual experiments.

E12.11 plenary meeting

Chairman made a shorter presentation at the E12.11 plenary meeting on these results, which were well accepted by the attendees including E12.11 Chair, Nick Hale. Nick encouraged further work on the Modified Allard method.